REPEATABILITY ESTIMATES AND EFFECT OF AGE ON EGG PRODUCTION IN SHIKA BROWN LAYING HENS REARED IN SEMI-ARID REGION OF NIGERIA

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ABSTRACT
The purpose of this study was to investigate the repeatability estimates of, as well as effect of age on, egg number in Shika Brown laying hens raised in the semi-arid region of Nigeria. Freshly laid eggs collected from Shika Brown laying hens, aged 25 weeks, were used for the study. Data were collected on egg production record over a period of ten (10) weeks. Data collected were subjected to statistical analysis of variance using the procedures of SPSS (20.0.0). Results showed that age (weeks) had significant ($P<0.05$) effects on egg production with the highest egg production recorded at weeks 26 and 28 (1040.83 and 1031.63 respectively with the overall egg number of 802.74. The overall repeatability estimates (±SE) of egg production obtained was found to be high (0.610±0.020). The findings of this study suggest that egg production in Shika Brown laying hens raised in semi-arid region of Nigeria can be considered moderately repeatable. This study is of relevance to the poultry industry, particularly in semi-arid regions, as it will give a better understanding of the egg production characteristics of this breed of chicken.
Keyword: Egg production, Layers, semi-arid region, repeatability

INTRODUCTION
In Nigeria, poultry sector accounts for about 58.2% of total livestock production (Amos, 2006). The poultry sub-sector offers the quickest returns on investment in livestock business because of its short gestation interval, high feed conversion ratio and it is one of the cheapest sources of animal protein (Ojo, 2002).
Repeatability is the ratio of the broad genetic variance and the portion of the environment to the phenotypic variance. Repeatability estimates indicates the proportion of individual components to the total phenotypic variance which indicates the relationship between repeated measurements of the same individual (Falconer and Mackay, 1996):
Repeatability estimates measure the degree of relationship between records of the same animal, thus repeatability may be used to predict the number of successive prediction of performance capacity of an individual animal before it is culled. Egg production differs from one period to another hence repeatability estimates will guide breeders to design appropriate breeding programs to improve egg production (Udeh, 2010). The objective of this study, therefore, was to evaluate the repeatability estimates of egg number of Shika Brown hens at different production periods.

MATERIALS AND METHODS
Location of the study
The experimental site is Prof Lawal Abdu Saulawa Livestock Teaching and Research Farm, Animal Science Department, Federal University Dutsin-Ma. The coordinates of the study area is as described by Rotimi *et al.* *(*2020).
Experimental animal and their management
Shika Brown laying birds, aged 25 weeks, were used for this study. The birds were kept on battery cages. Feed and water were given to the birds *ad libitum*.
Data collection
The egg production records were taken over the period of ten (10) weeks, from 25th and 34th weeks of laying. Data were collected on weekly egg production.
Statistical analysis
Data obtained were analysed following the procedures of SPSS (version 20.0.0). One-way analysis of variance (ANOVA) procedure was used to determine the effect of age on egg production. Duncan's Multiple Range Test (DMRT) was used to separate the means. Variance components for repeatability estimates were estimated using the method of the General Linear Model procedure of SPSS (version 20.0.0). The linear model used was:

$Y_{ij} = \mu + A_i + e_{ij}$

Where,

Y_{ij} = Observation on the jth egg number of the ith weeks;
μ = Overall population mean;
A_i = effect of ages (weeks) (i = 1, 2, … , 10);

e_{ij} = error term

The analysis of variance technique was employed to estimate variance components which were utilized in the estimation of repeatability for egg production.

Repeatability estimates (R) were obtained using the method of Becker (1984).

$$R = \frac{\delta_B^2}{\delta_B^2 + \delta_W^2}$$

Where,

δ_W^2 = Variance component within birds

δ_B^2 = Variance component between birds

The standard error (S.E.) of repeatability (R) was calculated as:

$$S.E = \sqrt{\frac{2(1-R)^2[1+(K-1)R]^2}{K(K-1)(N-1)}}$$

Where:

K = Number of records per age (weeks) of bird;

R = Repeatability coefficient;

N = Total number of observations.

RESULTS AND DISCUSSION

Table 1 shows the mean, standard error (SE) and coefficient of variation (CV) of egg production. Results show that age had significant effect (P<0.05) on egg number. Egg production was significantly higher in weeks 26, 28 and 29 while the least value was recorded in the 34th week of lay. However, there was consistent decrease in egg production from 32nd week to 34th week. This decrease could be due to old age in the birds as reported by Tůmová *et al*. (2014). Consequently, Yakubu *et al*. (2017) observed that egg production started increasing from age 37 to 38 of age (weeks). Wolc ***et al*. (2007) stated that e**gg is t**he most important trait in layer selection programs.**

Table 1: Descriptive statistics of egg number in Shika Brown laying hens

Age (weeks)	N	Mean	SE	CV
25	30	844.80^{c}	61.44	7.27
26	30	1040.83^{a}	21.31	2.05
27	30	657.57^{d}	50.14	7.63
28	30	1031.63^{a}	26.92	2.61
29	30	952.60^{ab}	25.49	2.68
30	30	841.43^{c}	18.10	2.15
31	30	912.30^{bc}	15.02	1.65
32	30	836.87^{c}	14.69	1.76
33	30	588.50^{d}	33.52	5.70
34	30	320.83^{e}	19.30	6.02
Overall	**300**	**802.74**	**15.80**	**1.97**

N = No. of Observations, SE = Standard Error, CV = Coefficient of variations, ^{a,b,c,d,e}Means with different superscript along the column are statistically different (P<0.05).

The estimates of repeatability for egg production (egg number) in Shika Brown hens examined in the present study are presented in Table 2. Repeatability estimates of egg production recorded in this study were generally high (R = 0.945 – 0.997) across the period of study. The repeatability estimates obtained were higher than values reported on; Harco and Lohman breeds (Toye *et al.*, 2012) and Hubbard Hybrid layers (Sado, 1988). The high repeatability estimates of egg production recorded in this study disagreed with the assertion of Chineke (1999) and Oyedapo *et al*. (2007), who reported that repeatability estimates of egg production are generally low. Similarly, Szwaczkowski, (2003) reported a generally low repeatability estimates for reproductive traits. This was attributed to the huge influence of environmental and age-related factors (Falconer, 1989).

Table 2: Variance components and repeatability estimates of egg number in Shika Brown layers hen.

Age	Variance between	Variance within	Repeatability estimates	Standard error

(Weeks)	(δ_B^2)	(δ_W^2)	(R)	(SE)
25	2129737.780	113233.407	0.950	0.192
26	3248639.497	13625.868	0.996	0.001
27	1289638.510	75432.461	0.945	0.228
28	3190627.517	21744.861	0.993	0.004
29	2720391.455	19488.248	0.993	0.004
30	2123047.152	9830.116	0.995	0.002
31	2496197.414	6764.562	0.997	0.001
32	2119158.036	6471.637	0.997	0.001
33	19714648.912	53666.126	0.997	0.001
34	307684.676	11174.075	0.965	0.095
Overall	**48648.544**	**31146.894**	**0.610**	**0.020**

CONCLUSION

The study shows that the repeatability estimates of Shika Brown laying hen in this study is generally high, this will guide breeders to design appropriate breeding programs to improve egg production

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